What is claimed is:

1. An amplifier system comprising:

a power amplifier operative to amplify an input signal; and

a mode selector that controls the operation of the amplifier between a polar mode and a linear mode based on a characteristic of the input signal relative to a threshold level.

2. The system of claim 1, the power amplifier having an input terminal and a supply terminal, the mode selector transmits a phase modulated signal component of the input signal to the input terminal and an amplitude modulated signal component of the input signal to the supply terminal during polar mode operation, and the mode selector transmits a composite signal component to the input terminal and a substantially constant amplitude signal component to the supply terminal during linear mode operation.

3. The system of claim 1, the input signal being a phase and/or amplitude modulated signal and the threshold level being an envelope amplitude level associated with the input signal, the power amplifier operates in the polar mode at input signal envelope amplitude levels above the threshold level and in a linear mode at input signal envelope amplitude levels below the threshold level.

4. The system of claim 1, the mode selector having a first output coupled to an input terminal of the power amplifier through a first digital-to-analog converter (DAC) and a second output coupled to a supply terminal of the power amplifier through a second DAC and a modulation amplifier, the mode selector transmits digital representations of an amplifier input signal component and an amplifier supply signal component to the first and second DACs, respectively, which convert the digital representations into analog signals.

5. The system of claim 4, at least one of the first and second DACs being delta-sigma DACs, such that the digital representations of at least one of the amplifier input signal component and the supply signal component are converted into the analog domain directly at a desired radio transmission frequency.

6. The system of claim 4, the modulation amplifier being one of a Class-S type and a Class-G type modulator.

7. The system of claim 1, the power amplifier being a linear class type amplifier with a constant class.

8. The system of claim 1, further comprising a predistortion component that modifies one of a composite signal component of the input signal and polar components of the input signal to mitigate output distortion of the power amplifier.

9. The system of claim 1, further comprising a digital cross-cancellation component that generates a reference signal corresponding to a desired output signal of the amplifier system, the clean reference signal being combined with a portion of an output signal from the power amplifier to determine an error signal, the error signal being inverted and combined with a delayed version of the output signal of the power amplifier to generate a final output signal.

10. The system of claim 9, the reference signal being provided to a delta sigma digital-to-analog converter (DAC) to convert the reference signal from the digital domain to the analog domain directly to a desired radio transmission frequency.

11. The system of claim 9, further comprising a peak-to-average reduction (PAR) component that removes large peaks signals from the input signal, the digital cross-cancellation component adding the large peak signals back to the final output signal.

12. The system of claim 1, further comprising a feedback path to compensate for variations in age and temperature of the amplifier system.

13. A transmitter comprising the amplifier system of claim 1.

14. A base station comprising the transmitter of claim 13.

15. An amplifier system comprising:

a power amplifier;

a modulation amplifier having an output coupled to a supply terminal of the power amplifier;

a first digital-to-analog converter (DAC) coupled to an input terminal of the power amplifier;

a second DAC coupled to the input terminal of the modulation amplifier; and

a digital system having a first output coupled to an input of the first DAC and a second output coupled to the input of the second DAC, the digital system controls the operation of the amplifier system between a polar mode and a linear mode based on a characteristic of the input signal relative to a threshold level.

16. The system of claim 15, the digital system transmits a phase modulated component of an input signal to the input terminal of the power amplifier and an amplitude modulated component of the input signal to the supply terminal during the polar mode, and the digital system transmits a composite component of the input signal to the input terminal of the power amplifier and a substantially constant amplitude signal to the supply terminal of the power amplifier during the linear mode.

17. The system of claim 16, the input signal being a phase and amplitude modulated signal and the threshold level being an envelope amplitude level, the amplifier system operates in the polar mode at input signal amplitude levels above the threshold level and in the linear mode at envelope amplitude levels below the threshold level.

18. The system of claim 15, at least one of the first and second DACs being delta-sigma modulated DACs, such that digital signals provided to at least one of the first and second DACs are converted into the analog domain directly at a desired radio transmission frequency.

19. The system of claim 15, the modulation amplifier being one of a Class-S type and a Class-G type modulator and the power amplifier being a linear class type amplifier.

20. The system of claim 15, further comprising a predistortion component that modifies signals provided to the power amplifier to mitigate output distortion of the power amplifier, and a digital cross-cancellation component that generates a reference signal corresponding to a desired output signal of the amplifier system, the clean reference signal being combined with a portion of an output signal from the power amplifier to determine an error signal, the error signal being inverted and combined with a delayed version of the output signal of the power amplifier to generate a final output signal.

21. An amplifier system comprising:

means for amplifying a phase and amplitude modulated input signal; and

means for switching operation of the amplifier system between a polar mode and a linear mode based on a characteristic of the input signal relative to a threshold level.

22. The system of claim 21, further comprising means for converting the input signal into a polar representation of the input signal, the polar representation comprising a composite signal component having an amplitude modulated component and a phase modulated component, the amplitude modulated component supplying the means for amplifying and the phase modulated component being amplified by the means for amplifying during the polar mode, and the means for amplifying being supplied by a

constant amplitude signal and the composite signal component being amplified by the means for amplifying in the linear mode.

23. The system of claim 21, further comprising means for converting at least a portion of the input signal from the digital domain to the analog domain directly to a desired radio transmission frequency.

24. The system of claim 21, further comprising means for modifying the input signal and means for modifying the output signal to facilitate amplifier system efficiency and mitigate out-of-band (OOB) emissions.

25. A method of amplifying an input signal with a power amplifier, the method comprising:

switching a mode of the power amplifier between polar mode operation and linear mode operation based on a characteristic of the input signal relative to a threshold level;

transmitting a phase modulated component of the input signal to an input terminal of a power amplifier and an amplitude modulated component of the input signal to a supply terminal of the power amplifier during polar mode operation, and transmitting a composite signal to the input terminal and a constant amplitude component to the supply terminal during linear mode operation; and

amplifying the input signal *via* the power amplifier while continuously switching modes between polar mode operation and linear mode operation.

26. The method of claim 25, further comprising transmitting the amplified input signal to at least one receiver.

27. The method of claim 25, further comprising converting at least a portion of the input signal from the digital domain to the analog domain directly to a desired radio transmission frequency prior to providing at least a portion of the input signal to the power amplifier.

28. The method of claim 25, further comprising at least one of modifying the input signal and modifying the output signal to facilitate the efficiency and mitigate out-of-band (OOB) emissions of the power amplifier.

29. The method of claim 25, the threshold level being an envelope amplitude level.